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BY PROFESSOR EDWARD FRANKLIN BUCHNER,  
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A psychological 'review of reviews' finds a wider task than that of merely bringing into view that which is so recently new. Both a glancing backward and a looking forward are involved. What is it that is new? is the only inquiry that inspires research. A survey in any branch of science may be regarded as either historical or anticipatory. Yet, in a peculiar way, it is true that research in the making is not history. Both as to aim and as to method, science can never become historical. The two conceptions are antagonistic. It is the wide-spread acceptance of this belief that leads to the annual flooding of the different branches of science with contributions of new data and new reconstructions. And science finds itself constantly in the making.

The most conspicuous fact in the welfare of psychology in the year under review is found in connection with the Darwinian anniversaries which met with well-nigh universal celebration.<sup>1</sup> In our recent reports we have found frequent occasion to record the changes and advances in the study of consciousness due to a more and more

<sup>1</sup>*Fifty Years of Darwinism.* Centennial Addresses in Honor of Charles Darwin, before the American Association for the Advancement of Science, Baltimore, Friday, January 1, 1909. New York, 1909. (One address on 'Evolution and Psychology' by G. Stanley Hall).

*Darwin and Modern Science.* Essays in Commemoration of the Centenary of the Birth of Charles Darwin, and of the Fiftieth Anniversary of the publication of the 'Origin of Species.' Edited by A. C. Seward, Cambridge University Press, 1909. (One essay on 'Mental Factors in Evolution' by C. Lloyd Morgan; on cognate subjects, as philosophy by Höffding, sociology by Bouglé, religion by Waggett and Harrison, language by Giles, anthropology by Haeckel, and 'Descent of Man' by Schwalbe). — It may be supposed that the question of any doubter as to the scientific character of psychology is now settled once for all by this unequivocal recognition given it in these Darwinian surveys!

consistent recognition of the theory of evolution. And the centenary of the birth of the author of 'The Origin of Species' gave opportunity to psychology to express its obligation to him and to recognize his contributions to its teachings. These contributions are limited to the evolution of instinct and the part played by intelligence in the process, the evolution of mind from the lowest animal to the highest man, and the expression of emotion.<sup>1</sup> But their importance is emphatically signified in the acquisition of the functional standpoint, won in the last ten years, and in the addition of the genetic method to the equipment of our science for its observations and its interpretations as well.

In recent years it has not been the fashion to offer systematic attempts at the solution of such a problem as the nature of consciousness. Such a problem does not seem to be satisfied wholly with the returns available from detailed and special inquiries. How broad a term consciousness can become and how extensive its problem is, can be seen in the efforts of others than psychologists *von Fach* to make contributions. The evolutionary conception and the consequent belief in the unity of the life processes are largely to be credited with these newer efforts. Semon's conception of the *engram*, or the trace of a stimulus left on an organism of the botanical type, recently gave Francis Darwin occasion to express anew the mnemonic conception of evolution. Semon has now sketched, as he thinks, a new psychology, based on the possible existence of the psychic in plants, involving a rather elaborate treatment of original sensations and the complications of the *engrams*.<sup>2</sup> With less interest in general theory, and more care for observation, Polowzow has given us the results of her patience in noting the responses of a few specimens only.<sup>3</sup> Although studying geotropism and the influence of gases, she hints at the possibility of psychic processes in plants, but refrains from answering the question as to the quality of the life process considered from the psychical point of view. Within the proper domain of our science, Marshall has essayed to work out "a special manner of viewing consciousness as a whole, by which we are enabled to treat the problems of psychology in a more scientific and orderly manner than is possible from the points of view usually taken."<sup>4</sup> Consciousness, regarded as 'psychic existence as such' and not as awareness, is 'system,' comprising 'presentations,' both large and small groups, involved in past and present

<sup>1</sup> Angell, 'Influence of Darwin on Psychology,' *PSYCH. REV.*, Darwin number, May, 1909.

<sup>2</sup> *Die Mnemischen Empfindungen*, Leipzig, 1909.

<sup>3</sup> *Untersuchungen über Reizerscheinungen bei den Pflanzen*, Jena, 1909.

<sup>4</sup> *Consciousness*, New York, 1909.

interaction upon each other. Neururgic facts and noetic correspondences are the two aspects treated.

The problem of the method available for psychological purposes was at one time — and that not long since — chiefly a single problem, and as it was solved, so would the science as a whole stand or fall. The determination to be seriously inductive has happily changed the whole situation. It would be an entire lack of appreciation of results to say that experimentation is mostly a matter of method; it is this, but it is also something more. One of the interesting phases of work at present is the readiness with which a critique of methods is being carried on. The presidential address before the American Psychological Association, at the Baltimore meeting, found the variety of method a good sign of health, presaging further differentiations in the science.<sup>1</sup> Stratton specifies the current difficulties as due to a confusion as to the significance of a psychical fact, causal explanation (which should include psychical causation), and the analysis of mental facts. The delay of its report by the committee on the standardization of tests and measurements, of the same organization, suggests something of the difficulties involved in this field. The salivary-reflex method, devised by Pawlow some years ago, has undergone some improvements, thus making itself more adaptable for the investigation of many psychic reactions than those conspicuous organic reflexes of respiration and pulse whose use brought notable results years ago.<sup>2</sup> Its limitation to those animals which possess this particular reflex does not detract from its value in comparative psychology. The use of 'muscle-reading' as another method has been tested by Downey, and seems to promise some new possibilities for the study of the delicacy of motor adjustments, the limitations of motor expressions, varying impulsiveness among individuals, and peculiarities in the types of imagery.<sup>3</sup> Nakashima has shown the applicability of the 'direct-reaction-method' for a study of affective processes.<sup>4</sup> The psychogalvanic reaction, mentioned in our last report, has received further test by Sidis and Kalmus.<sup>5</sup> They reached the conclusion "that active

<sup>1</sup> 'Toward the Correction of Some Rival Methods in Psychology,' *PSYCH. REV.*, Mch., 1909.

<sup>2</sup> Yerkes and Morgulis: 'The Method of Pawlow in Animal Psychology,' *PSYCH. BULL.*, Aug., 1909.

<sup>3</sup> 'Muscle-Reading: A Method of Investigating Involuntary Movements and Mental Types,' *PSYCH. REV.*, July, 1909.

<sup>4</sup> 'Contributions to the Study of the Affective Processes,' *Amer. Jour. of Psych.*, Vol. XV., 1909, p. 181.

<sup>5</sup> 'A Study of Galvanometric Deflections due to Psycho-physiological Processes,' *PSYCH. REV.*, Nov., 1908, and Jan., 1909.

physiological, sensory and emotional processes, with the exception of pure ideational ones, initiated in a living organism, bring about electromotive forces with consequent galvanometric deflections." *Æsthetic experiences seem to have no effect. The method of psychological analysis through a study of association reaction-times has also come in for additional tests. Yerkes and Berry devised four experiments chiefly for purposes of class demonstration and report this method to be a successful key to the content of consciousness.*<sup>1</sup> In substantial agreement with this are the results ascertained by Henke and Eddy, who tested the same method.<sup>2</sup> "Accurate judgment is reasonably certain, in event the situation is so controlled that the diagnosis takes the simple form of determining between two possible alternatives, the exact motive of which is definitely known by the experimenter." That 'a third party can draw right conclusions,' and that the subject's knowledge of the method 'does not make a correct diagnosis impossible' are even more interesting criteria of the method. Seashore makes a renewed and general call for greater experimental accuracy, especially in educational psychology, and specifies the scientific advantages accruing through the adoption of a 'homogeneous content in the measurement of continuous memory processes' as over against the uncertainties of numbers, poetry, prose, and similar material.<sup>3</sup> Claparède has shown the possibility of bringing order among the variety of methods by basing a classification on the psychological processes involved.<sup>4</sup>

The interest in the physical conditions of consciousness continues to direct various inquiries, as in former years, but without bringing forward any centralized theme or striking results. With all the physiological alertness of the present time, it is rather remarkable that we do not find renewed attacks upon the nature of neural energy. Whether this is a call for a vague systematic generalization of what is already known, or a charge that physiology is quite content to neglect this apparently important matter, may be left for the physiologist to answer. When the nature of energy and its mode of transmission in organisms are known, there are doubtless many problems in normal and abnormal human psychology and in comparative psychology that would

<sup>1</sup> 'The Association Reaction Method of Mental Diagnosis,' *Amer. Journ. of Psych.*, Jan., 1909.

<sup>2</sup> 'Mental Diagnosis by the Association Reaction Method,' *PSYCH. REV.*, Nov., 1909.

<sup>3</sup> *PSYCH. BULL.*, July, 1909.

<sup>4</sup> 'Classification et plan des méthodes psychologiques,' *Arch. de psych.*, Vol. VII., July, 1908.



find more or less explanation. The theory of tropism is one effort to resort to physico-chemical laws for an analysis of those physical phenomena that appear in connection with various orders of psychic organization. But this theory does not seem elastic enough to incorporate within itself that progressive organization in neural energy which must be recognized as accounting for the types of organisms and their respective conscious experiences. At the Sixth International Congress of Psychology Alrutz reported on 'telekinesis,' or the transference of nervous into an external expression of physical energy, which may have something of suggestion toward the general problem here indicated.<sup>1</sup> The astonishing republication of most of the sixty-five-year old edition of Spurzheim's work shows how completely our self-credited recent sciences of man have failed in their censorship of that which is prejudicial to their own truths.<sup>2</sup> The possible brief historic importance of phrenology fails to justify this new printing; and one would miss his cue to surmise that these views offer something definite in the absence of that knowledge of the neural conditions of consciousness which seem so greatly needed now.

Most of us probably think that the psychological laboratory has fully justified its establishment and has become a permanent equipment in science. It has not, however, passed beyond the time of misconception. Billia would have us believe in a negative answer to his question: 'Has the Psychological Laboratory Proved Helpful?'<sup>3</sup> "A psychological laboratory! I do not know what there is in the shop, but it must be admitted that it could not have a droller sign." The name is a contradiction, and should be dispensed with in order that the science may become 'truthful.' That the laboratory intends to continue 'all its good intentions' may be seen from the continued supply of introductions and text-books. One of the best evidences of 'progress,' particularly as based on experiments, is to be found in the many changes and additions which have led Titchener's rather recent 'Outline' to grow into the two-volume presentation of the science for the purposes of teaching the student.<sup>4</sup> The appearance of Myers' work is a wholesome sign that experimental psychology has become a fixture in England, where it was so long refused recognition.<sup>5</sup> Schulze has

<sup>1</sup> Ogden, PSYCH. BULL., Nov., 1909, p. 391.

<sup>2</sup> *Phrenology, or the Doctrine of the Mental Phenomena*, ed. by C. Elder, Philadelphia, 1908.

<sup>3</sup> Address, Int. Cong. of Phil., Heidelberg, 1908; trans. in *Monist*, July, 1909.

<sup>4</sup> *A Text-Book of Psychology, Part I.*, New York, 1909.

<sup>5</sup> *A Text-Book of Experimental Psychology*, London, 1909.

provided an excellent description of the methods and apparatus of the laboratory which will serve appropriate pedagogical purposes.<sup>1</sup> More significant than all these is the fact of the entrance last year of Wundt's *Grundzüge* upon the *sixth* edition, a tribute at once to steady accretions to the science and to the commanding importance of this work.

The long-suspected importance of 'organic' sensations is beginning to be cleared up by definite knowledge. Becher, continuing the work of Meumann, finds great individual differences in the sensibility of the internal organs.<sup>2</sup> They are not so sensitive as the skin. In cases of sensitivity, localization is fairly accurate, the œsophagus is sensitive to warmth, cold, pressure, pain, and electrical stimulation; veins are sensitive to pain, the heart, arteries, stomach and intestines seem to be insensitive. Murray has shown the difficulty attending efforts at differentiating internal and external sensations, and notes the necessity of massing sensations in order to get the qualities.

The experimental attack upon attention has been considerably advanced by the work of Geissler, who sought 'evidence for the possibility of an adequate measurement of attention in terms of clearness values.'<sup>3</sup> His subjects readily recognized nine degrees of clearness. He found a close parallelism between variations in degrees of attention and the corresponding differences in the accuracy of work performed at the different levels, the work being influenced only by the change of attention. On the other hand, introspection failed to estimate the work as accurately as the degrees of attention. In dealing with his principal problem of the relation of intensity of simultaneously sensed tones, Peterson has considerably enlarged our theory of normal auditory sensations.<sup>4</sup> The psychology of skill has been carefully and exhaustively gone over anew by Book,<sup>5</sup> who finds short periods of retardation of progress to be due chiefly to lapses in spontaneous attention and effort. Plateaus are not a necessity, and they are not significant as periods of progress; but the disappearance of bad habits and

<sup>1</sup> *Aus der Werkstatt der experimentellen Psychologie und Pädagogik*, Leipzig, 1909.

<sup>2</sup> 'Ueber die Sensibilität der inneren Organe,' *Zl. f. Psych.*, Vol. XLIX., Hft. 5, 1908; *Arch. f. d. ges. Psych.*, Vol. XII., Hft. 3-4, 1909; cf. Meumann, *Ibid.*, Vols. XIV. and XVI., 1909; Murray, 'Organic Sensations,' *Amer. Journ. of Psych.*, July, 1909.

<sup>3</sup> 'The Measurement of Attention,' *Amer. Journ. of Psych.*, Oct., 1909.

<sup>4</sup> 'Combination Tones and other Related Auditory Phenomena,' *PSYCH. REV., Mon. Supp.*, No. 39, Nov., 1908.

<sup>5</sup> 'The Psychology of Skill with Special Reference to its Acquisition in Typewriting,' University of Montana Publications in Psychology, 1908.

interfering associations is more important for the progress to become well established.

The inordinate interest in memory is shown by the great volume of contributions in this field, Wundt going so far, in a recent estimate, as to say that at least one half of the annually appearing studies in experimental psychology now belong to the psychology of memory.<sup>1</sup> This mass of material makes necessary such a monograph as that of Offner, in which he has well summarized the experimental work on memory.<sup>2</sup> Less satisfactory is the briefer, more popular summary, which is less faithful to the material at hand, prepared by Watt.<sup>3</sup> In his difficult study on auditory memory, in which he endeavored to determine the presence, nature and function of auditory imagery, Kühlman found this material markedly unstable and very fragmentary. The most important factor in recall was the motor processes in initiating the sounds. According to Segal, the general theory of distinct types of ideation, now so long familiar, is defective, and will have to be abandoned, and in its place there will come a quantitative distinction in order to account for the mixed types which most persons present.

The psychology of the thought processes, which has been growing apace in this decade, has been greatly enriched by Titchener's five lectures.<sup>4</sup> Declining to accept the older views of imageless thought, and doubting the exhaustiveness of the analyses that accept feelings of relation as further unanalyzable, he summarizes the work recently done in our laboratories in order to state the present situation. "There is no need, as things are, to swell the number of mental elements; the psychology of thought, so far as we have it, may be interpreted from the sensationalistic standpoint, and so far as we still await it, may be approached by sensationalistic methods." And thus a program is laid, looking 'to the outcome of future experiment.' Psychology is more and more marking the line of cleavage between itself on one hand and logic and theory of knowledge on the other. And this résumé of the situation promises to become focal for some time to come. Washburn thinks to solve the problem of the thought processes 'by admitting that they are not, for immediate introspection, sensational, while yet

<sup>1</sup> *Psych. Studien*, Vol. V., Hft. 1-2, 1909.

<sup>2</sup> *Das Gedächtniss: die Ergebnisse der experimentellen Psychologie und ihre Anwendung in Unterricht und Erziehung*, Berlin, 1909.

<sup>3</sup> *The Economy and Training of Memory*, London, 1909.

<sup>4</sup> 'On the Analysis of Auditory Memory Consciousness,' *Amer. Journ. of Psych.*, April, 1909.

<sup>5</sup> *Lectures on the Experimental Psychology of the Thought-Processes*, New York, 1909.

holding that the physiological processes underlying them are of the ordinary sensory type.<sup>1</sup>

By employing the method of direct reaction to the affective processes, Nakashima has shown that affective judgments may be and usually are, as direct and immediate as sensory judgments.<sup>2</sup> The time required for the formation of the former is longer than that of the latter, and the affective times and their variability are either absolutely or relatively of the same order as sensory times and their variability. Ribot inquires into the causes for the poverty of the psychology of pleasure as compared with the psychology of pain.<sup>3</sup> By studying several cases of idiocy, imbecility, and dementia, and comparing these with normal cases, Mignard attempts to throw some light on the origin of the feeling of pleasure or satisfaction.<sup>4</sup> The James-Lange theory and the intellectualistic theory do not account for the feeling of delight when experienced in the absence of vasomotor or of excessive intellectual activity. Extreme inactivity may lead to the feeling of delight. The sense of pleasure originates in the completion (real or imagined) of an act, not in the mere process of activity. A new statement of the physical theory of pain has been given by Ioteyko and Stefanowska.<sup>5</sup> Pain is produced by 'specific algogenic substances generated at the moment of strong stimulation.' The arguments offered for this theory of the intoxication of the terminals of the pain nerves probably leaves room for additional necessary support.

The fields of individual, genetic, social and educational psychology are offering newer opportunities for inquiry, and continue to receive contributions characterized by zeal both for pure science and for its practical applications. It is in these directions, plus that of abnormal psychology, that an applied psychology is struggling to organize itself. And the recent years will in future stand out as representative of the labors to turn our science to a practical account. On the eve of the larger psychological orientation that seems to be imminent, Wundt essays to point out the dangers ahead of this quest for the practical.<sup>6</sup>

<sup>1</sup> 'The Physiological Basis of Relational Processes,' *PSYCH. BULL.*, Nov., 1909.

<sup>2</sup> *Loc. cit.*, and 'Time-relations of the Affective Processes,' *PSYCH. REV.*, Sept., 1909.

<sup>3</sup> 'Sur la nature du plaisir,' *Rev. Phil.*, Aug., 1909.

<sup>4</sup> 'La joie passive (béatitude) et la théorie du sentiment agréable,' *Journ. de psych. norm. et path.*, Mch.-Apr., 1909.

<sup>5</sup> *Psycho-physiologie de la douleur*, Paris, 1909.

<sup>6</sup> 'Ueber reine und angewandte Psychologie,' *Psych. Studien*, Vol. V., Hft. 1-2, 1909.

This premature search for an applied psychology leads inevitably to a reinstatement of the old faculty psychology. Witmer, on the other hand, insists that 'no valid distinction can be made between a pure and an applied science.'<sup>1</sup> "The development of an applied psychology assures the future of psychology as a pure science, for in the final analysis the progress of psychology, as of every other science, will be determined by the value and amount of its contributions to the advancement of the human race." Binet and Simon have elaborated the details of a method of testing intelligence, during the growth of children, which can also be applied to cases in mental pathology.<sup>2</sup> A gradation of tests is worked out to suit the average normal activities of each year between the ages of three and thirteen years inclusive. For each of the various years there is a group of tests, comprising from four to eight items, and designed to appeal to many diverse capacities. While 'intelligence' must necessarily be a very elastic term here, the general plan is fundamentally serviceable. The Sterns have contributed new material on the earlier years of mental growth, gathered from observations on their own three children.<sup>3</sup> In giving a fresh résumé of the material in animal and human psychology contributory to a thorough-going genetic theory, Kirkpatrick suggests the new word 'organoses' to specify behavior, or organic activity, both conscious and unconscious, as contrasted with 'neuroses' and 'psychoses.'<sup>4</sup> The field of social psychology seems less and less likely to receive a generally accepted demarcation. McDougall endeavors 'to show that the springs of all the complex activities that make up the life of societies must be sought in the instincts and in the other primary tendencies that are common to all men, and are deeply rooted in the remote ancestry of the race.'<sup>5</sup> He accordingly employs the seven instincts of flight, repulsion, curiosity, pugnacity, self-assertion, self-abasement, and the parental function, and their emotional developments in weaving his patterns of social organization. Ross, on the other hand, does not find any essential social factor in experience, or social element in consciousness.<sup>6</sup> A social psychology can deal only with 'the psychic planes and currents that come into existence among men in consequence of their asso-

<sup>1</sup> 'The Study and Treatment of Retardation: A Field of Applied Psychology,' *PSYCH. BULL.*, April, 1909.

<sup>2</sup> 'Le développement de l'intelligence chez les enfants,' *Année Psych.*, XIV., 1908.

<sup>3</sup> *Erinnerung, Aussage und Lüge in der ersten Kindheit*, Leipzig, 1909.

<sup>4</sup> *Genetic Psychology*, New York, 1909.

<sup>5</sup> *An Introduction to Social Psychology*, London, 1908.

<sup>6</sup> *Social Psychology: An Outline and Source Book*, New York, 1908.

ciation,' and is therefore not a part of psychology at all, but a branch of sociology. Thomas finds some psychological concepts useful and suggestive for the purposes of social analyses, but denies that the social process can be reduced to any single function, such as 'imitation' or 'conflict.'<sup>1</sup> Mumford has suggestively shown how the conditions of primitive life make for personality and authority.<sup>2</sup> In the light of some tendencies appearing in social theories, it may ere long become a serious question whether any room will be left in which psychology, as ordinarily understood, may be permitted to stand. The encroachments of the physiological and the genetic from one side, and the social from the other, may eventually eliminate our science of consciousness as found in the individual.

By way of contrast, there is a more cordial belief in the significance of psychology for the problems arising in the region of the more ideal interests of æsthetics, religion, and valuation in general. Laurila answers his question as to the source of æsthetic impression by referring to a single origin, which he identifies as the function of feeling.<sup>3</sup> In her experimental observations, Martin shows the presence of 'pseudo-sensations' from the 'lower' senses, but adds that no æsthetic theory can base itself on these factors alone.<sup>4</sup> Clay traces artistic preferences back to instincts necessary for survival, and regards art as 'the interpretation of environment by helping toward harmonious adjustment.'<sup>5</sup> And the results of recent æsthetical studies have been interestingly summarized by Gordon for the purposes of instruction.<sup>6</sup> Leuba has made a brief analysis of three types of human behavior, as mechanical, coercitive, and anthropopathic, and suggestively used them as a basis of a theory of the origin and nature of religion.<sup>7</sup> The problem of primitive development is thus solved by maintaining the probable priority of magic and the independence of religion from magic. How completely psychological theory and methods are coming to a command of elusive religious experience is rather convincingly shown in Cutten's extensive summary of conclusions reached by many workers

<sup>1</sup> *Source Book for Social Origins: Ethnological Material, Psychological Standpoint, Classified and Annotated Bibliographies for the Interpretation of Savage Society*, Chicago, 1909.

<sup>2</sup> *The Origin of Leadership*, Chicago, 1909.

<sup>3</sup> 'Ist der ästhetische Eindruck aus einer oder mehreren Quellen abzuleiten?' *Arch. f. d. ges. Psych.*, Vol. XV., Hft. 1-2, 1909.

<sup>4</sup> 'Ueber ästhetische Synästhesie,' *Zt. f. Psych.*, Vol. LIII., Hft. 1, 1909.

<sup>5</sup> *The Origin of the Sense of Beauty*, London, 1908.

<sup>6</sup> *Æsthetics*, New York, 1909.

<sup>7</sup> 'On Three Types of Behavior,' *Amer. Journ. of Psych.*, Jan., 1909; and *The Psychological Origin and the Nature of Religion*, Chicago.



in the field.<sup>1</sup> In her subtle analysis of prayer, Strong crosses and re-crosses the border-line between social and religious phenomena, and shows how the one can illumine the other.<sup>2</sup> Prayer is a form of the imaginative social process, which contributes to the building up of the social self, and involves the interaction of two selves present in consciousness needing adjustment. The outcome is the union of the me and the alter in a larger self-hood in the individual. The completely social type of prayer exhibits the tendency of being either æsthetic, as resting in the experience itself, or ethical, as demanding a passage as quickly as possible into action. The wider region of values, which has of late been extending problems for psychological analysis, has received notable contributions during the year. With more than a scientific interest involved, Münsterberg has given us an augmented English version of his philosophy of worth.<sup>3</sup> Believing that "the psychological analysis of the different types of worth feelings, and the formulation of the laws of valuation based upon this analysis, give us the scientific concepts with which to interpret the concrete facts of valuation," Urban discovers, as he thinks, a strictly new problem, and offers the new science of 'axiology.'<sup>4</sup> Experiences of value, as facts, and the evaluation of these experiences provide the basis of description and appreciation which must go hand in hand in a functional and genetic study of worth objects.

Comparative psychology has well entered the period of its development where the principles and methods of investigation find such substantial agreement as to make the present-day task almost wholly that of learning at first hand the facts of behavior. Bohn is one of those who probably think more of theoretical construction than of detailed investigation.<sup>5</sup> The method of Pawlow, already mentioned, which was at first supposed to have more physiological and less psychological value, is now regarded as especially meritorious as a highly specialized mode of observation in the field to which the type of reflex necessarily limits its use. Edinger's call to recognize more fully the relations of comparative anatomy to comparative psychology is one that should, and will be, more heeded than in the past.<sup>6</sup> An

<sup>1</sup> *The Psychological Phenomena of Christianity*, New York, 1908.

<sup>2</sup> *The Psychology of Prayer*, Chicago, 1909.

<sup>3</sup> *The Eternal Values*, Boston, 1909.

<sup>4</sup> *Valuation; its Nature and Laws: Being an Introduction to the General Theory of Value*, London, 1909.

<sup>5</sup> *La naissance de l'intelligence*, Paris, 1909.

<sup>6</sup> 'Die Beziehung der vergleichenden Anatomie zur vergleichenden Psychologie,' *Bericht d. III. Kong. f. exp. Psych.*, Leipzig, 1909; see *Journ. of Comp. Neur. and Psych.*, Nov., 1908.

anatomical knowledge of an animal's brain is a key to the probable mental functions it can exercise. And if a structural basis is not present, why experiment for such functions as can only be exercised when the particular structure is given? In a way, it is true that this view presupposes that the correlated work in the two sciences has already been completed. Forel proposes a special international congress in order to save mental therapeutics from the hands of the charlatan.<sup>1</sup> In separating psychotherapy from psychiatry, Münsterberg endeavors to bring forward 'the too-long neglected psychical factor' as an agent for influencing the welfare of the sick 'in a serious, systematic way' so as 'to emphasize the aspect of scientific psychological theory.'<sup>2</sup> The training of the physician must now henceforth include scientific medicine and scientific psychology. By ruling out the subconscious, and making much of the reënforcing and inhibitory effects of suggestion, he brings the theme out of the realm of the mysterious. In his study of mental make-up in functional psychoses, Hoch has found that 'in most cases of dementia præcox there are peculiarities in the patients before the psychosis develops.'<sup>3</sup> The most significant of these he found to be what he terms the 'shut-in personality.' This type is the most frequent in this disorder and the most clearly circumscribed. Diefendorf and Dodge have devised a new method of registering and comparing eye-movements in the different forms of mental disorder, and studied the speed, reaction-time, and kinds of eye-movements.<sup>4</sup> Criminal psychology is still an open chapter in the science, which Wulffen has tried to fill by summarily bringing together all the material now available from the more modern point of view.<sup>5</sup>

The drift of interests in our science continues to find a fairly permanent quantitative record in the *Psychological Index*.<sup>6</sup> This international document shows the steady widening of interests and the certain ratio of increase in the number of contributions. In the last issue it was found 'necessary this year to omit some of the less important titles owing to the increase in the size of the *Index*.' Even under this limitation the volume of entries for 1908 grew to 3,532 titles, being

<sup>1</sup> *Journ. für Psych. und Neur.*, Vol. XI., Heft 6.

<sup>2</sup> *Psychotherapy*, New York, 1909.

<sup>3</sup> *Journ. of Nerv. and Ment. Disease*, Apr., 1909.

<sup>4</sup> 'An Experimental Study of the Ocular Reactions of the Insane from Photographic Records,' *Brain*, Vol. XXXI., 1908.

<sup>5</sup> *Psychologie des Verbrechens; Ein Handbuch für Juristen, Aertzte, Pädagogen und Gebildete aller Stände.* 2 vols., Lichterfelde, 1908.

<sup>6</sup> *The Psychological Index*, No. 15, May, 1909.

an increase of more than 17.5 per cent. over the record of 1907. The incorporation of 'psychotherapy' as a new topic in this issue reflects the amount of active interest in the medical application of psychological principles. A comparison of the number of contributions to the literature made in 1908 with that made the preceding year reveals the interesting fact that six of the ten chief topics retain their relative position. These are the first four and the last two, as shown in the accompanying table. Anatomy and physiology of the nervous system and general, cognition, and conation and movement have respectively exchanged places with each other. This unusually steady record for two years may become significant. The greatest increase in single rubrics belongs to general, genetic, individual and social psychology, and sleep, trance and pathology. Notwithstanding the large total increase three rubrics show a falling off, namely, sensation, cognition and relations of consciousness.

1907		1908	
No. of Titles.	Rubric.	No. of Titles.	Rubric.
641	Genetic, individual and social psychology.	782	Genetic, individual and social psychology.
605	Philosophical implications of psychology.	646	Philosophical implications of psychology.
507	Sleep, trance and pathology.	616	Sleep, trance and pathology.
465	Sensation.	461	Sensation.
217	Anatomy and physiology of the nervous system.	337	General.
185	General.	290	Anatomy and physiology of the nervous system.
143	Cognition.	189	Conation and movement.
142	Conation and movement.	132	Cognition.
68	Conditions and relations of consciousness.	49	Conditions and relations of consciousness.
24	Affection.	30	Affection.
2,997		3,532	

As shown by the instructive statistics of the number and distribution of doctors' degrees conferred by American universities, now being kept by *Science*,<sup>1</sup> the year was a favorable one for psychology. Out of the three hundred and eighty-seven degrees of doctor of philosophy conferred by these institutions in 1909, twenty-one were bestowed for work done in psychology. Thirty universities gave degrees this year; of these, twelve institutions conferred one or more degrees in psychology. It is interesting to note also that our science is one of the thirty subjects in which the doctorate may be earned. It still ranks fourth in the list of the twenty *sciences* recognized in this statistical

<sup>1</sup> 'Doctorates Conferred by American Universities,' *Science*, Aug. 20, 1909.

classification, and seems almost ready to displace zoölogy from its rank as third. The average number of degrees conferred annually in psychology during the twelve years of these records is about fifteen; and 1909 is noticeably above this general average.

One's national zeal need not be unduly gratified in finding another interesting record of progress in psychology in America. Cattell's observations indicate a rapid growth in the activity in our laboratories, which were opened so steadily in the last decade of the last century.<sup>1</sup> "In geology, zoölogy, botany, anthropology and psychology, there is probably more research work published here than in any other country except the German Empire, and the amount of research work published is the most tangible, and perhaps the most exact, measure of scientific activity. I have found that in the *Zeitschrift für Psychologie* there have been more articles in Experimental Psychology reviewed (selected as the more important articles) from America than from the German-speaking nations combined, and more than ten times as many as from Great Britain. We have also, according to the criterion of membership in foreign academies, the most eminent living psychologist."

The year has not omitted some achievement in the direction of organization and publication. The University of Bonn is to have a psychological laboratory, established by Külpe. Psychology is to receive space in the new annual, *Die Philosophie der Gegenwart*, edited by Ruge, which is to present a classified and annotated survey of current literature, beginning with the year 1908. The contributions to psychological method and material by the Freud school have become so extensive as to lead to the establishment of a *Jahrbuch für psychoanalytische und psychopathologische Forschungen*, edited by Bleuler, Freud and Jung.<sup>2</sup> Special literature which has been hitherto too widely scattered will probably be brought together in the new international review *Epilepsia*, edited by Donath and Muskens in coöperation with an international board of editors, which is devoted to the study of epilepsy and similar nervous disorders from the pathological, therapeutic, social and legal points of view. The list of Italian journals has been increased by the new *Rivista di Filosofia Neoscholastica*, edited by Canella and Gemelli, and modified by the new *Rivista di Filosofia*, which combines the *Rivista Filosofica* and the *Rivista di Filosofia e Scienze Affini*. A special *Monograph Series* has been begun by the *Journal of Nervous and Mental Disease*.

<sup>1</sup> 'American Scientific Productivity,' *Science*, Feb. 5, 1909.

<sup>2</sup> First volume; Leipzig, 1909, pp. 318.

Those interests of the science which can be best kept alive through associations and their activities were well provided for during the year. In addition to the larger and smaller, national and local, general and special organizations which have come to have fixed meetings, 1909 was marked by the two-weeks' Conference on Child-Welfare in July, at Clark University, the five-day Sixth International Congress of Psychology in August, at Geneva, and the two-weeks' celebration of the Twentieth Anniversary of Clark University, in September. The first brought together the movements and organizations that deal with the practical interests and the scientific study of the child.<sup>1</sup> In effecting a permanent Conference on Child-Welfare and Research, and especially in the establishment of the Child-Study Institute, we have a new efficient project for further inquiry, and a future program that is to work out a correlation of scientific studies and those that advance the practical, physical, mental, and moral welfare of children. The Sixth Congress continued the work of its predecessors more successfully by delimiting its contributions to specific topics, placed in the hands of selected reporters, and proposing future work through committees looking towards unification and standardization in some fundamental problems. If the topics selected and the order of their discussion can be at all representative of dominant and difficult problems in the science today, one finds the central themes to be as follows: the psychology of religion, the subconscious, retardation of children, animal psychology (tropism and orientation), feelings, perception of the body, and method of educational psychology. Experimental and physiological psychology seemed to stay more in the background. Unification and standardization are desired and to be worked out in the matters of terminology, colors, errors in testimony, and notation of the ages of children. Uniformity in these matters can be only helpful and will not prevent continued expression of individual initiative in further studies. Psychology shared with pedagogy one week at the Clark University celebration. The status of individual and experimental psychology, psychiatry, animal psychology, and anthropology was presented by Stern, Titchener, Freud and Jung, Jennings and Boas.

In the deaths of H. Ebbinghaus, of Germany, V. Egger, of France, F. Paulsen, of Germany, William T. Harris, of America, and C. Lombroso, of Italy, the science has this year lost the services of men rare in their respective achievements for psychology as an experimental pursuit, as based on introspection, as significant for

<sup>1</sup> See fourteen papers, *Ped. Sem.*, Sept., 1909.

philosophy, as fundamental for the peculiar interests of education, and as interpretative of the criminal type of mind. The work of Ebbinghaus in fixing new stakes in the field of psychology as an independent science, based on experienced and observable facts is peculiarly notable. In 1885 appeared his classic, experimental treatment of memory, the first advance upon the activities more complex than the sensory-motor processes. In 1890 he was one of the founders of the *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*. In less than nineteen years, the *Zeitschrift für Psychologie* (more recently issued alone) completed fifty-one volumes — a monument to him as well as to the unprecedented growth of the science through the application of experimental methods. His *Abriss der Psychologie* is a model of scientific brevity.<sup>1</sup>

<sup>1</sup>Translated and edited as a text-book by Meyer, Boston, 1908.



## RELEARNING A SKILLFUL ACT: AN EXPERIMENTAL STUDY IN NEURO-MUSCULAR MEMORY.

BY EDGAR JAMES SWIFT,

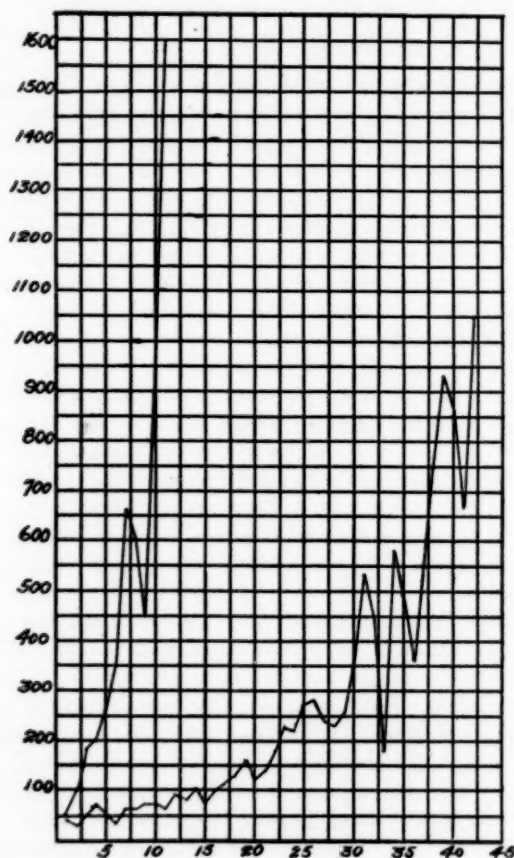
*Washington University, St. Louis.*

The following investigation shows the length of time required to regain the skill previously acquired in tossing two balls with one hand, one ball being caught and thrown while the other was in the air. The original investigation in which the skill was first gained was finished December 11, 1902. Five succeeding monthly tests of the effect of the intermission of practice ended May 21, 1903, and one memory test was made on September 13, 1904. The memory test with which this paper deals began December 28, 1903. With the exception of the five monthly tests of the effect of the intermission of practice and the one memory test which are referred to above, the subject has had no practice whatever since the first investigation was completed in 1902. Six years and seventeen days had therefore passed since the conclusion of the series of experiments by which the skill was first acquired. The memory test<sup>1</sup> of 1904, one year and two hundred and seventy-five days after the close of the learning series, showed no loss of skill. The result of the present test is shown in the accompanying curves. The curve of the first investigation of the learning process, made in 1902, is seen on the right while that of the present memory test is shown on the left.

The memory test consisted as before of ten trials, and the same balls were used as in the previous experiments. The curve shows that much of the acquired skill had been lost, but the process of re-learning was rapid. There were only two days of delay in the otherwise continuous progress. It was noticeable that 'collisions,' which were among the chief obstacles in the first practice days, six years and seventeen days before, occurred only twice in this series, except during the two days of delay in progress, when they were frequent. Since on the first of these two days the subject was not feeling as well as usual the effect of physical indisposition upon motor efficiency is obvious. Eleven days were required to regain the skill which in the earlier work had required forty-two days of practice. At the conclu-

<sup>1</sup>*Am. Journ. Psych.*, Vol. XVI., 1905, p. 131.

sion of this test the subject had attained a skill of sixteen hundred catches in ten misses, against ten hundred and fifty-one of the earlier work. That he actually had more skill than at the end of the practice of the first investigation was also indicated by the feeling of greater ease in making the score. Except for fatigue, it seemed as though he could continue indefinitely without missing. The former methods of



avoiding collisions, and of handling the balls, were adopted immediately and involuntarily. The chief difficulty was in readapting the smaller muscles to the work. This readaption is quite as much a neural as a muscular matter.

Since the earlier investigation of the writer on the effect of right hand practice on the skill of the left hand showed that ball-tossing is hardly less a matter of nerve centers than of the muscles, these results, taken in connection with the former memory test,<sup>1</sup> would seem to indicate a saving of time and effort by occasional and somewhat prolonged intermissions in the work upon a topic of study, at least after a certain proficiency has been gained. The length of time which may profitably intervene will vary no doubt with different kinds of subject matter and with the age of the pupil, but evidently the mind continues its activity, for a time, in the furtherance of a learning process after practice and study have ceased. The most advantageous number of recitations or lectures per week in a given subject of study should also be investigated in this connection.

<sup>1</sup> *Loc. cit.*

## A DEMONSTRATION OF THE TRIAL AND ERROR METHOD OF LEARNING.

BY DANIEL STARCH, Ph.D.,

*University of Wisconsin.*

Learning by trial and error is undoubtedly the most fundamental method by which the child acquires motor control. The two other methods of learning,<sup>1</sup> by imitation and by understanding or ideational control, are chiefly supplementary to this primary method. Its importance is too well known to require further comment.

The object of this paper is to describe what has proved to be a convenient laboratory experiment for demonstrating the trial and error method of learning and also to present some typical results obtained thereby.

The experiment consisted of tracing the outline of a six-pointed star as seen in a mirror. This activity is particularly well adapted for demonstrating trial and error because it involves the establishment of new coordinations between motor and perceptual processes. The experiment can also at the same time be used to illustrate cross-education.

The use of the star pattern has several advantages over other outlines that might be used, as for example, the irregular maze. First, it requires frequent change in the direction of movement, which insures sufficient difficulty and variety of action. Second, the different sections of the outline are of equal length, which furnishes regularity. Third, the outline is of sufficient length to be reasonably difficult and yet not cause noticeable fatigue. The pattern used was three and one half inches in diameter across the extremes of the points.

The experiment as performed by the students is as follows:<sup>2</sup>

<sup>1</sup> Mentioned for example by Kirkpatrick in *Fundamentals of Child Study*, p. 83.

<sup>2</sup> A simple and convenient wooden frame used in the experiment for holding the mirror and writing material and shielding the hand from direct view was devised by Prof. W. F. Dearborn. It consists essentially of a horizontal base 18 × 18 inches on which the writing material is placed. At the middle of one edge is an upright for holding the mirror. Eight inches above the base and parallel with it is a light wooden board supported at the sides to serve as a shield.

(a) Tracing one half of one outline with the left hand. (b) Tracing ten complete outlines with the right hand. (c) Tracing another half with the left hand. The results are then tabulated to show the exact time and number of errors of each tracing. The two tracings made with the left hand serve to illustrate the effect of practice with the right hand upon the left hand. Only half of the outline was traced in order not to gain too much practice with the left hand.

The first attempts demonstrate in a convincing way the trial and error procedure. It is brought out particularly well by the several difficult places encountered. A typical illustration is given in Fig. 1. In those situations an effort to reason out the direction of movement is of little or no help. Apparently the only way to reach the line is to keep on trying until one succeeds.

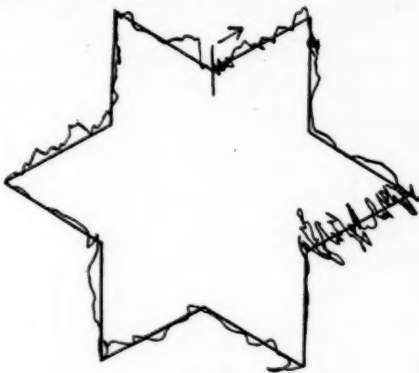


FIG. 1.

Fig. 2 presents a typical curve of acquiring the coördinations in the star tracings. It represents one hundred records made by the writer with the right hand at the rate of one a day on consecutive days without interruption except between the fortieth and forty-first records (one day) and between the forty-sixth and forty-seventh records (two days). The upper curve is the time curve and the lower one is the error curve.

The two curves represent the usual course of learning in that they indicate very rapid improvement at first followed by slower progress later. This rapid improvement extends in the error curve over the first seven records, while in the time curve it extends over the first twenty records. In this connection it is of interest to observe that the improvement in time and errors aside from the first seven or eight

records is at no time parallel. Either the error curve improves rapidly and the time curve remains stationary, or vice versa. The error curve shows a gradual lowering after the first rapid drop until about the fiftieth record. This is accompanied in the time curve by the first rapid drop and then a continuous standstill and even loss until about the fiftieth record. After that the error curve has reached its dead level and the time curve again shows a gradual improvement until about the ninetieth record when both seem to have reached their limits.

The implication seems to be that the plateaus during which there is little or no improvement are an indication of more rapid development in some other aspect of the learning process which is not measured by that particular curve. It seems therefore important in studies of learning to obtain as many different means of measuring progress of learning as possible.

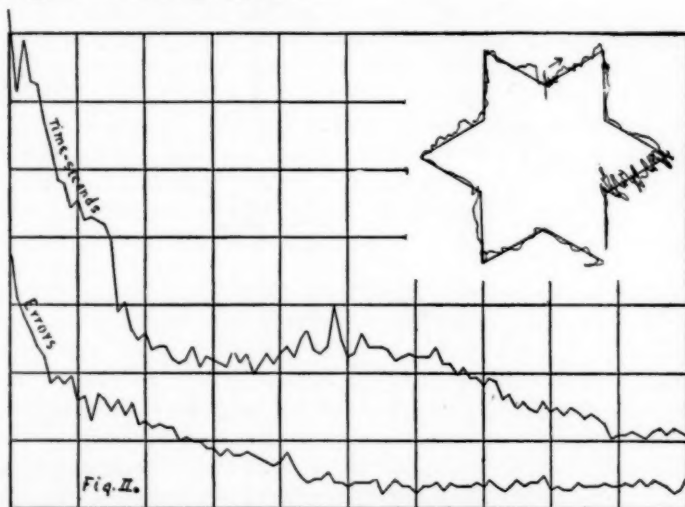


FIG. 2.

The effect of practice with the right hand upon the left hand is very considerable. One tracing was made with the left hand before and one after the practice represented in Fig. 2. The improvement with the right hand from the first to the last record was 84 per cent. in time and 92 per cent. in errors, average 88 per cent. The improvement of the record made after compared with the one made before the right hand practice was 85 per cent. in time and 81 per cent. in errors.

average 83 per cent. Another subject who made fifty tracings with the right hand showed an improvement of 82 per cent., and in the before and after tracings with the left hand 68 per cent. Ten laboratory students who made ten records each with the right hand improved on the average 53 per cent. In the before and after records, tracing with the left hand half of one outline each time, the average improvement was 49 per cent. Taking these results together they show that the left hand profits to the extent of 90 per cent. of the gain made by the right hand. From this however a small amount must be subtracted which is due to the practice derived from the first left hand tracing.

This experiment thus has several commendable points as a laboratory exercise. It is simple and convenient, it satisfactorily demonstrates cross-education and the trial and error method, and its results are definitely measurable. It could also be used advantageously to investigate several problems in the psychology of learning, in particular, the genetic development of muscular coördination, comparing children with adults, adaptation in acquiring a new motor habit, cross-education, transference of training, and the effect of different intervals between records upon the rate of improvement.



## PSYCHOLOGICAL LITERATURE.

### ÆSTHETICS.

*Beiträge zur experimentellen Aesthetik.* LEONHARD WL. LEGOWSKI. Archiv f. d. Ges. Psychol., 1908, XII., 236-311.

The object of the experiments recorded in this article is to determine what psychological factors enter into judgments concerning the esthetic value of simple geometrical figures, such as squares, triangles, arcs, etc. The paper is divided into three chapters. Chapter I. discusses the serial method as used by the author and the results and laws obtained from the experiments; Chapter II. compares the results obtained by the use of the serial method and those secured by using the method of 'combination and comparison in pairs.' Chapter III. is devoted to a description of the apparatus used by the author and contemporary investigators in the determination of the cause of pleasantness in figures which are bilaterally symmetrical, with comparison of the results obtained and the theories involved.

The method used in the first set of experiments is a modification of Professor Külpe's 'Reihenmethode' and was designed to facilitate the judging of the affective states of the subjects during the experiments. The modification consists in presenting the figures prearranged (instead of indiscriminately) according to a mathematical or physical series and requiring a recombination into an esthetic series, with the most pleasing and the least pleasing figures forming the extremes. The tables show that in the conversion of the mathematical series (*e. g.*, a series of triangles presented arranged according to their altitudes) into the esthetic series, the original order has taken a decidedly different configuration. The average time required for this rearrangement was only three minutes.

An attempt was made to determine the importance of associated ideas as compared with the immediate or direct impression. The subject was instructed to form his esthetic series according to the immediate impression made on him directly upon presentation of the mathematical series and he was then asked whether associated ideas had had any influence in the formation of the esthetic series. In about one half the judgments associated ideas could not be eliminated, the resultant series being a compromise between the two factors. It was

found that both the relative and the direct factors play an important part in the formation of esthetic values.

The experimental results show relatively constant agreement as to which was considered the most pleasing figure, but even so simple a figure as the triangle has in it several elements which may give rise to a special viewpoint. The author formulates the law derived from these experiments in the words, "In general, simplicity and ease of perception, symmetry and regularity are the most important characteristics which influence the esthetic judgment of simple geometrical figures." The author believes this is due to the fact that psychical analysis is easier.

Chapter II. is devoted to a discussion of a set of experiments in which the author compares the results obtained by his serial method with those from the method of presenting the figures in pairs. The results from this latter method do not vary essentially from those obtained by the serial method except in that the judgments were less definitely made. This the author attributes to the fact that when two figures are very similar it is more difficult to choose the more pleasing figure, and when they are very dissimilar there is a strong tendency to image a third figure which is more pleasing than either of the presented figures. The differences in the time required by the two methods was very marked (one hour as compared with three minutes by the serial method). This is likely to lead to disturbing secondary causes (fatigue, declining interest, taciturnity) which undoubtedly influence the judgments of the subjects.

The esthetic reaction method of Haines and Davies was not found very satisfactory by the author. Since the figures were singly presented, the presented figure was always compared with the preceding figure and thus no esthetic series could be formed. It is also quite likely that the tactual and kinesthetic sensations resulting from the motor reactions might act as a disturbing element.

Chapter III. deals with the formation of the most pleasing bilateral relations, proportions and arrangements in which simple geometrical figures (both black and in colors) can be arranged on a background. The results of Professor Pierce and Professor Puffer in investigations along similar lines are compared. Pierce concludes that the cause of pleasantness when figures are bilaterally arranged around a center may be found in the symmetry of the eye movements. Professor Puffer concludes that pleasantness is due to an equal distribution of attention to each side of the bilateral figure. The author maintains that if this is true we might find any figure pleasing provided the attention is

properly distributed. Professor Legowski does not think it necessary that the pleasantness of a combination of figures, or a single figure, be referred to physiological or subjective states. He believes the cause of the pleasantness should be sought in the characteristics of the figures themselves. From an analysis of the most pleasing figures (bilateral) the author again finds simple arithmetical proportions (1 : 2, 2 : 3, 3 : 4, 4 : 5) and he concludes that regularity is the cause of the pleasantness. The results from using colored figures did not materially affect the final results.

A. P. WEISS.

UNIVERSITY OF MISSOURI.

*The Power of Music.* HALBERT HAINS BRITAN. *Journal of Philos., Psychol. and Sci. Methods*, 1908, V., 352-357.

This article is concerned with those factors which have given to music such a wide distribution under differences of race, natural intelligence and education, and with those factors to which it owes its power to stimulate the emotions to a greater extent than any of the other arts. Considerable emphasis is placed on the biological significance of sound and its efficiency as a means for communicating the most striking differences of mental coloring. One of the causes of this peculiar power is the susceptibility to rhythmical stimulation which had its origin in metabolism and purely physiological changes but subsequently became inherent in the functional activity of the nervous system, thus giving it the force and clamant strength of instinctive activity. In the translation of the sensuous factor into the more subjective elements and symbolism of music, the variety and dynamic character of its stimuli give it an advantage over the other arts which is most nearly approximated by literature as exemplified in the drama and the novel. In painting, power and energy are inferential—the mode of representation is static and of such a nature as to exclude that characteristic which the author calls 'harmonic progression.'

A. P. WEISS.

#### ETHICS.

*The Objectivity of the Moral Judgment.* F. C. SHARP. *Philos. Review*, 1908, XVII., 249-271.

In order to establish objectivity in morals, Professor Sharp answers the questions: (1) Is objectivity a fact? (2) What is the content of the objective standard? The answer to the first question is in the affirmative, because the author holds that every moral judgment can be shown to make certain claims whose validity can be determined by an

appeal to the facts. The answer to the second question is reached by an examination of the validity of the arguments which have been presented in support of a number of different ethical standards.

The author reaches the conclusion that whenever malevolence, esthetic considerations, or unreasoned antipathy enter into a moral judgment, no consistent principle can be formulated. In the 'eudæmonistic' standard, the objective form of which is, 'Choose always the greater good,' Professor Sharp believes he has found a guide to conduct which can be modified so as to show how great the amount of service is that one person owes another. Error in making moral judgments arises most frequently from our tendency to put ourselves in the place of the agent instead of that of the impartial spectator.

From a consideration of the facts connected with the making of moral judgments the author derives his own standard, which is expressed in the words, "Right is that which we approve of everyone's doing under the conditions." In foreseeing a possible objection to the variable and accidental nature of this standard, Professor Sharp refers the problem to metaphysics. Ethics as such is unable to reach a more satisfactory standard. The place of man in the universe and the relation of his moral and other ideals to ultimate reality can be determined only by a spiritualistic metaphysics.

A. P. WEISS.

#### SPACE CONCEPTION.

*Space and Mathematical Reasoning.* L. J. RUSSELL. *Mind*, 1908, XIII., 321-349.

Mr. Russell states that the object of his paper is 'to develop a view of space on the analogy of that of number.' He says that 'space' and 'number' are alike in that both are 'abstractions'; both are 'forms' existing only as they give 'meaning to the matter of experience.' According to Mr. Russell, 'space' is an '*a priori*' intuition of the mind. The "view of space ultimately come to will be found to be a modification of Kant's view" (p. 321).

"Beginning with a simple conception of space we gradually go on to add elements, etc." (p. 329), till the concept is complete. Continuing, approvingly interpreting Kant, he says "for us to tell with any certainty which is the geometry of actual space, we must have an *a priori* intuition of space" (p. 330). "Measurements tell us nothing about space itself. They only tell us about relations of bodies in space to one another" (p. 336). The different geometries do not give hypotheses as to the nature of space but are 'constructs in

space.' "When we want space, it puts us off with a spatial determination" (p. 337).

I take it that these views are sufficient to classify Mr. Russell, and that adverse criticism would be simply crying out the obvious.

But in the interests of accuracy the author's treatment of Bertrand Russell is open to severe criticism. He quotes Bertrand Russell as saying, "'The propositions of Euclid involve a great number of assumptions which are incorporated into the proofs,'" he then goes on to say himself, "Hence the reasoning is unsound, involving, as it does, unexamined assumptions" (p. 328). What Bertrand Russell does say is, "But enough has been said to show that Euclid is not faultless, and that his explicit axioms are very insufficient" (*The Principles of Mathematics*, p. 407).

Besides misquotation and illogical deductions, how completely our author misinterprets Bertrand Russell is shown by the following paragraph:

"But there is still Mr. Russell's theory of Mathematics to deal with. For it asserts that final definitions *can* be given of the various elements used in Mathematics, and that there is no need to do any more than work with these elements, using the principles of deduction. This then constitutes a direct denial of our assertion that the definitions of Mathematics cannot be made final, and that Transcendental Logic must be used" (p. 330).

Bertrand Russell does not pretend to *define* 'all the various elements used in mathematics.' But he does say, "all the entities that occur in mathematics can be defined in terms of those that occur in the above twenty premises," and this under the chapter headed 'The Indefinables of Mathematics.'

Either Mr. L. J. Russell is completely ignorant of the modern theories of number, conceptions of order, etc., or else he has most carefully concealed his knowledge.

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UNIVERSITY OF MICHIGAN.

#### LANGUAGE.

*L'ensemble de la psychologie linguistique.* R. DE LA GRASSERIE.  
Revue philosophique, 1908, LXV., 225-255.

Ideology is the term which the author proposes to cover the psychology of language in its broadest lines. Such a science would treat of phonetics and the principles of accent; of the natural history of terms and the significance of words, as well as of the general mor-

phology of language, or syntax. Dominant categories under which linguistic psychology must work are those of the contrast between (1) concrete and abstract, (2) subjective and objective, (3) material and immaterial, (4) development or unfolding and growth or enfolding, (5) condensation and dispersion of thought, (6) formalism and non-formalism, (7) phenomenon and noumenon.

Unfortunately only a few of these categories are worked out at all in the article and some of the more puzzling titles receive no further treatment after their first mention. The distinction between concrete and abstract is illustrated by several instances of the inability of primitive races to find expressions for anything not particular. The distinction between the material and the immaterial rests at bottom upon the same shortcoming of the primitive mind, but if the author is fully aware of this, he fails to hold faithfully to his own insight when he attributes the loss of Latin inflections in the transition to French to the inability of an uncivilized people to maintain such an elaborate grammatical machinery. The doctrine that the earliest languages tend to enrich single words with elaborate particular meanings properly involves the further point that in the growth of language these stigmata are lost and each term becomes more and more able to stand without change in any context. The proposed science of ideology would be a psychology of groups; and of products rather than processes.

WARNER BROWN.

UNIVERSITY OF CALIFORNIA.

*Langage et Pensée.* ALFRED BINET and TH. SIMON. Année psychologique, 1908, XIV., 284-339.

The mind of the imbecile is that of a child fixed once and for all at a certain stage of development. The study of such minds offers a new field for genetic psychology, freed from many of the embarrassments that beset its usual methods, for the imbecile can be examined as to his intellectual acquisitions, while his acquisitiveness, as compared with that of the normal child, is nil. Moreover, the changelessness of the imbecile mind makes possible a thorough experimental exploration lasting as long a time as one pleases.

The advantages of this newly proposed method are demonstrated by its application to the genesis of language and the relation of language and imagery to the nature of thought. Now that 'imageless thought' has become a familiar phrase we ought not to balk at 'wordless thought.' Images, words, acts, are only the functioning or outward manifestation of thought, which is itself, according to the authors,



a variety of feeling. Since language appears at a very early age in man, and since a speaking imbecile is a very short step in intelligence above a mute idiot, while there are abundant evidences that comprehension of language precedes speech, the latter is not so important a sign of intellectual standing as it is sometimes taken for. Thought independent from language at different intellectual stages is shown in three strong clinical pictures; one of an imbecile using only a dozen words; another of an aphasic; and a third of an imbecile possessing a considerable vocabulary, but who evidently 'thought more than he said.' The conclusion does not do justice to other abnormal types which share with normal children the impulsive tendency to say more than they think, but it marks one more step beyond the 'faculty psychology' of thought, feeling and action, and it rests on a new and important method which must be taken account of in the future.

WARNER BROWN.

#### COMPARATIVE PSYCHOLOGY.

*The Daily Life of Amœba Proteus.* DAVID GIBBS. Amer. Journal of Psychol., 1908, XVI., 232-241.

A rather detailed account of the activities of several amœbæ, during six days and five nights. A curve shows the differences in the degrees of activity of an amœba, during the entire time it was observed. Other curves show that the amœba is less active in a field of abundant food supply, than in a field where the food supply is limited. There are still other curves, which show the exact amount, and the direction of movement of several different amœbæ during several days. Drawings show an amœba in pursuit of paramœcium. It was found that amœbæ exhibit choice in food, e. g. some of them would leave algæ to pursue ciliates. Special care was required to keep the amœbæ under normal conditions, and still allow of their being observed under the microscope.

The observations show that, even in a form as low as the amœba, we find distinct periods of rest, which correspond to sleep in the higher forms. It seems that the skill which the amœba shows in its pursuit of a paramœcium, is acquired by the 'method of trial and error.' Amœbæ were often found in contact, but no trace of conjugation was observed. On the other hand, they were frequently observed to avoid each other.

OTTO KUNKEL.

UNIVERSITY OF MISSOURI.



## DISCUSSION.

### HELMHOLTZ' EXPLANATION OF DIFFERENCE TONES.

In a recent number of the BULLETIN,<sup>1</sup> Mr. Peterson takes me sharply to task for following Helmholtz in my explanation of the ear-generated difference tones.<sup>2</sup> "That these tones take their origin in the middle ear," is just what recent investigations, so far as the writer is aware, do *not* show. If there is any part of Helmholtz' theory that has not stood the test it is just this part. Unfortunately, Professor Titchener cites no literature on these recent investigations."

I am afraid that Mr. Peterson has not consulted the literature cited in my *Text-book*. My first reference is to Schaefer's essay on audition in Nagel's *Handbuch*, where he might have read the following passage. "Helmholtz has . . . proposed the hypothesis that the drum-skin and the adjacent structures are to be regarded as the place of origin of the subjective combinational tones. I have convinced myself that this hypothesis is correct (*das Richtige trifft*) by an . . . experimental investigation which has shown . . . that telephone membranes and membranes of the form of the drum-skin . . . produce objective . . . combinational tones. The physical derivation (*Begründung*) of these tones must, it is true, be different from that attempted by Helmholtz for the drum-skin."<sup>3</sup>

The reading of these sentences would have recalled Schaefer's paper *Ueber die Erzeugung physikalischer Differenzöne mittels des Stentortelephons*, published in the same year.<sup>4</sup> The author here

<sup>1</sup> 'Titchener on Helmholtz' Explanation of Combination Tones,' PSYCHOLOGICAL BULLETIN, VI., 1909, 397 ff.

<sup>2</sup> *A Text-book of Psychology*, I., 1909, 112.

<sup>3</sup> K. L. Schaefer, *Der Gehörssinn*, in Nagel's *Handbuch d. Physiol. d. Menschen*, III., 1905, 568 f.

<sup>4</sup> Drude's *Annalen d. Physik*, 4te Folge, XVII., 1905, 572 ff. Schaefer's abstract of this article in the *Zeits. f. Psych.*, XLII., 1906, 348 f., ends with the words: "It seems to me highly probable that Helmholtz was upon the right track with his hypothesis that the drum-skin is the place of origin of the combinational tones, although his mathematical derivation has often been disputed."

Both the essay in Nagel's *Handbuch* and the article in the *Annalen* are cited by Mr. Peterson in his *Combination Tones and Other Related Auditory Phenomena*, 1908. He finds (p. 101) that it is not clear whether Schaefer means to apply his results with membranes "to the inner membranes of the

refers to his experiments with plane and funnel-shaped membranes, and concludes with the sentence: "It appears that Helmholtz was upon the right track, although the explanation that he offered has met with a great deal of opposition."

In the next year, 1906, appeared Waetzmann's article, *Zur Frage noch der Objektivität der Kombinationstöne*.<sup>1</sup> I quote a single sentence. "The experiments just described . . . seem to me to furnish strong support to Helmholtz' derivation of the combinational tones, although it must be conceded that this derivation involves many errors of detail."

Here, then, in the experiments of Schaefer and Waetzmann, is the 'recent investigation' upon which I relied when writing the paragraph in my *Text-book*. It is strange that Mr. Peterson should have overlooked the evidence. However, to make my case complete, I must refer briefly to certain other studies that were available at the time.

In 1907, Bingham reported that "absence of the tympanic membranes does not prevent generation of 'subjective' difference-tones."<sup>2</sup> Mr. Peterson reminds us that Dennert made similar observations as early as 1887;<sup>3</sup> he might have added that Schaefer confirms them, on

ear, as part of his explanation of subjective combination tones." I think that Schaefer is clear enough, although he does not go into detail; Mr. Peterson was, perhaps, preoccupied with Schaefer's earlier theory (*Arch. f. d. ges. Physiol.*, LXXVIII., 1899-1900, 505 ff.). Here, again, the *Handbuch*, p. 568, would have helped him.

<sup>1</sup> Drude's *Annalen*, 4te. F., XX., 1906, 837 ff. Schaefer comments, in *Zeits. f. Psych.*, XLIV., 1907, 292: "The author finds in his experiments, as I find in my own, a support for the Helmholtzian hypothesis of the origin of the subjective combinational tones in the drum-skin, though this may contain many errors of detail, especially in its mathematical derivation." Again: in the same *Annalen*, XXIV., 1907, 68 ff. (*Zur Theorie der Kombinationstöne*), Waetzmann defends the Helmholtz theory against the familiar amplitude-objection: "bei unsymmetrisch elastischen Körpern genügen schon sehr kleine Amplituden, um höheren Potenzen der Elongation Einfluss auf die rücktreibende Kraft zu verschaffen." I understand that this defence applies to the drum-skin, though Waetzmann thinks that other structures (e. g., the liquid of the inner ear) may replace the drum-skin without prejudice to the essential features of the theory. I have not seen the work *Zur Helmholtzschen Resonanztheorie* (Breslau Habilitationsschrift, 1907) of which this article is said to give an abstract.

<sup>2</sup> Studies from the Psychological Laboratory of the University of Chicago, communicated by J. R. Angell: W. V. D. Bingham, 'The Rôle of the Tympanic Mechanism in Audition,' *PSYCHOL. REVIEW*, XIV., 1907, 229 ff.

<sup>3</sup> H. Dennert, 'Akustisch-physiol. Untersuchungen,' *Arch. f. Ohrenheilkunde*, XXIV., 1887, 171 ff.

the ground of unpublished communications, in 1905.<sup>1</sup> But, had he noted this latter fact, he would also have come upon Schaefer's explanation of it: Schaefer supposes that the membrane of the round window may now act as a telephone membrane, and may thus generate the tones in question. The assumption struck me as reasonable, and I accordingly discounted Dennert's objection.<sup>2</sup>

M. Meyer's theory of audition furnishes an explanation of difference tones;<sup>3</sup> but as I had decided to mention only the Helmholtz theory in my *Text-book*, I was unable to refer to it.

Hermann's *Neue Untersuchungen über die Natur der Kombinationstöne*<sup>4</sup> made less impression upon me at first reading than it does now, — probably because, at the time of writing, I was fully convinced of the existence of ear-generated difference tones. Hermann, of course, here ascribes the difference tones to the asymmetrical vibration either of some outside body or of the bones of the head.

There remains Mr. Peterson's own work upon *Combination Tones and Other Related Auditory Phenomena*.<sup>5</sup> The author suggests that the conditions of origin of objective and subjective combinational tones are in principle the same, and that the subjective tones may be referred to the fluids of the cochlea.<sup>6</sup> Neither suggestion is novel: Schaefer had argued from the analogy of telephone membranes to the

<sup>1</sup> Nagel's *Handbuch*, III., 569.

<sup>2</sup> Mr. Peterson writes: "These observations, of course, do not *prove* that the tympanic membrane and the ossicles *cannot* produce combination tones as Helmholtz supposed. They show, however, that Helmholtz' explanation is incomplete and for the most part useless; that it certainly does not touch the most important cause of combination tones." The first sentence is correct; but the second does not follow from the data. The removal of the normal cause may permit some other structure, under the changed conditions of stimulation, to take on a function that, with the normal cause present, it is prevented from discharging. And so the exposed membrane of the round window may perhaps take on the duties normally performed by the drum-skin; duties which, under ordinary circumstances, it is not called upon to perform.

<sup>3</sup> "An Introduction to the Mechanics of the Inner Ear," *Univ. of Missouri Studies*, Science Series, II., 1907, no. 1. Writing of the earlier presentations of Meyer's theory, Mr. Peterson remarks: "It is questionable whether Meyer's theory is an improvement upon that of Helmholtz even with respect to the intensity difficulty. And this is the very thing Meyer's theory was devised primarily to explain" (*Combination Tones*, etc., 95). From the footnote on p. 91, and the statements on pp. 129 f., I gather that the appearance of the new work has not changed his opinion.

<sup>4</sup> *Arch. f. d. ges. Physiol.*, CXXII., 1908, 419 ff.

<sup>5</sup> The most important references are 16-25, 56-65, 69 f., 77, 90 f., 95, 99 f., 103-106.

<sup>6</sup> See esp. 104.

assumed function of the drum-skin or (in default of a drum-skin) of the membrane of the round window; and Waetzmann, himself not original in the proposal, had declared his willingness to substitute the liquid of the labyrinth for the drum-skin and ossicles of Helmholtz' theory. I therefore found nothing in this work that I had not already considered.

I am, nevertheless, quite ready to admit that my acceptance of the Schaefer-Waetzmann view may have been prompted, in some measure, by the relief that every student of psychological acoustics must feel in getting 'back to Helmholtz.' In the winter of 1903-4 I took up with my Graduate Seminary the question of auditory theory; we worked through, with some care, the recent publications on the histology and physiology of the ear, and the whole long series of psychophysical hypotheses. We all, I think, ended the term with an increased respect for the resonance-theory; right or wrong, it explains more, as it also explains more neatly, than any of its rivals.<sup>1</sup> Stumpf, as is well known, has rejected it for two reasons: "weil es physikalisch so gut wie unmöglich erscheint, dass so winzige Gebilde auf die für uns hörbaren Töne noch mitschwingen sollen; aber auch wegen der Schwierigkeiten im Gebiete der Differenzttöne."<sup>2</sup> On the issue of physics we may, perhaps, be content to take Helmholtz' word; in the matter of difference tones, Schaefer and Waetzmann seemed to make Helmholtz' original idea more plausible than critics had allowed,—certainly more plausible than the alternative proposed by Ebbinghaus.

E. B. TITCHENER.

#### THE OBSERVER AS REPORTER: A CORRECTION.

My attention has just been called to a typographical error in my article upon 'The Observer as Reporter' in the *PSYCHOLOGICAL BULLETIN* of May 15, 1909. As this error concerns the formula for the computation of an important coefficient of report, I beg the opportunity to make the following correction: On page 159, formula 7, reliability of assurance should be computed as  $c(r)/c$ , not  $r/c$  as there printed.

GUY MONTROSE WHIPPLE.

<sup>1</sup> Mr. Peterson apparently shares this opinion; *op. cit.*, 130. I cannot subscribe, unreservedly, to all the points made in his comparative table; but complete agreement in such a case is hardly to be looked for.

<sup>2</sup> Konsonanz und Dissonanz, *Beitr. z. Akustik u. Musikwissenschaft*, I., 1898, 51 f.

# BOOKS RECEIVED FROM DECEMBER 5, 1909, TO JANUARY 1, 1910.

- Commissioner of Education Report.* Vol. I. Washington, Gov. Printing Office, 1909. Pp. iii + 598.
- The Ethics of Animal Experimentation.* JAMES ROWLAND ANGELL. Chicago, American Medical Association, 1909. Pp. 8.
- Mental Discipline and Educational Values.* W. H. HECK. New York, John Lane Company, 1909. Pp. 147.
- Unwritten Literature of Hawaii: The Sacred Songs of Hula.* NATHANIEL B. EMERSON. Washington, Gov. Printing Office, 1909. Pp. 288.
- Grundzüge der Ethik.* E. DURR. Heidelberg, C. Winter, 1909. Pp. vii + 383.
- The Classical Moralists.* Compiled by BENJAMIN RAND. Boston, Houghton Mifflin, 1909. Pp. xix + 797. \$3 net.
- Le sens de l'histoire.* MAX NORDAU. Paris, Alcan, 1910. Pp. 428. Fr. 7.50.
- Methods of Teaching.* W. W. CHARTERS. Chicago, Row, Peterson & Co., 1909. Pp. 255.
- Experimental Psychology of the Thought Processes.* EDWARD BRADFORD TITCHENER. New York, Macmillan Co., 1909. Pp. vii + 318.
- The Moral Life: A Study in Genetic Ethics.* ARTHUR E. DAVIES. (Library of Genetic Science and Philosophy, Vol. I.) Baltimore, Review Publ. Co., 1909. Pp. x + 187. \$2.
- Darwin and the Humanities.* JAMES MARK BALDWIN. (Library of Genetic Science and Philosophy, Vol. II.) Baltimore, Review Publ. Co., 1909. Pp. xii + 118. \$1.50.
- Philosophy as a Science.* A Synopsis of the Writings of PAUL CARUS. Chicago, Open Court Publ. Co., 1909. Pp. ix + 213.
- Essais sur la connaissance.* GEORGE FONSEGRIVE. Paris, J. Gabalda & Cie., 1909. Pp. 273.

## NOTES AND NEWS.

AT the request of the Belgian Government the United States Commissioner of Education has appointed a committee to have charge of American interests at the Third International Congress of Home Education, which will be held in Brussels this year. The committee

includes Professor M. V. O'Shea, University of Wisconsin, chairman, Professor W. C. Bagley, University of Illinois, secretary, and fourteen other members.

THE special committee appointed a year ago by the American Philosophical Association to forward the publication of the most important works of early American philosophers has reported a tentative list. Arrangements have already been made to reprint the *Elementa Philosophica*, 1752, of Samuel Johnson, first president of King's College, the expense of publication having been guaranteed by a friend of Columbia University. It is hoped that other universities and societies will assist in the work. The list selected includes, besides the above, *The Dudleian Lectures*, 1750-1850 (Harvard); selections from Jonathan Edwards, 1703-58 (Yale); John Witherspoon's *Lectures on Moral Philosophy*, 3d ed., 1810 (Princeton); Benjamin Rush's *Diseases of the Mind*, 1812 (Pennsylvania); selections from Thomas Jefferson, 1743-1826 (Virginia).

AT the recent meeting of the American Psychological Association at Cambridge, Mass., Professor W. B. Pillsbury (Michigan) was elected president for the coming year. Professor A. H. Pierce continues as secretary.

THE American Philosophical Association elected Professor C. M. Bakewell (Yale) president, Professor A. O. Lovejoy (Missouri) vice-president, and E. G. Spaulding (Princeton) secretary-treasurer. The next meeting will be held at Princeton.

AT the fifth annual meeting of the Southern Society for Philosophy and Psychology, held at Charlotte, N. C., December 28, 1909, the following officers for the year 1910 were elected: *President*: Edward Franklin Buchner (Johns Hopkins); *Vice-President*: Shepherd Ivory Franz (George Washington); *Secretary-Treasurer*: Robert Morris Ogden (Tennessee); *Members of the Council*: A. Caswell Ellis (Texas) and David Spence Hill (Peabody College for Teachers), to serve two years, and Bruce R. Payne (Virginia) and Haywood J. Pearce (Brenau College), to serve three years.

PROFESSOR J. W. BAIRD, of the University of Illinois, has been called to Clark University, to fill the chair formerly held by Professor Sanford, now president of Clark College.

PROFESSOR E. B. TITCHENER, of Cornell University, has been appointed to a research professorship at that institution, with the title of 'Sage professor of psychology in the Graduate School.'